SYMONS'S

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LONDON FOG.

IT is rather curious that simultaneously with the devotion of an unprecedented amount of time and talk to the discussion of London fogs, we have passed through an autumn and part of a winter singularly clear and free from fog.

In the winter of 1879-80 fog was unusually prevalent over the whole north-west of Europe, as a natural result of the meteorological conditions then dominant, viz., high barometric pressure, low temperature. and calm. Some persons suffer from cold, others are liable to bronchial affections. Hence when fog and frost co-exist, illness and mortality necessarily increase, but *all* the increase must not be charged against either *one* of the two factors.

In 1880 a rather thick and early fog occurred on Sunday, September 26th, and on October 13th *The Times* printed three letters and a leader upon the subject of fogs and fog prevention. This, and the fact that the subject is one upon which everybody feels competent to express an opinion, has led to the production of pages and pages of literature upon fogs. We certainly shall not follow with the stream, but try to sum up the whole matter (of which we have quite 50 pages before us) in two or three.

As to the cause of fogs there is perhaps no better authority than the paper by Mr. Dines in the *Quarterly Journal of the Meteorological Society*, Vol. V., p. 157, and the discussion thereupon. But it seems to us that the causes may be even more briefly stated than in that paper.

If water, or matter containing water, be warmer than the dew point of air resting upon it, the water will evaporate, and if the air be colder than the water the vapour in the air may become saturated with invisible vapour, and may, in addition, contain globules of water too minute for their weight to cause them to fall to the earth as rain, and which globules, breaking up the transparency of the atmosphere, produce what is called mist or fog.

Similarly, but conversely, if warm saturated air passes over ground which is much colder than itself, its capacity for retaining in an

invisible form all the water in it, is lessened by its own loss of heat, and the water, which it cannot hold invisibly, changes into the globular form, and so again we have the transparency of the air destroyed.

And this second explanation carries with it another point which may as well be disposed of, viz., the identity of cloud and fog. For see how perfectly this explanation accords with the cloud formation known as "pennants" from many isolated mountain peaks, and, to cite a single case, with the "table-cloth" at the Cape of Good Hope. A current of air relatively warm and damp drives against the summit of a lofty, and therefore, cold mountain; this chills the air, some of the vapour become visible, and a cloud is formed to the leeward of the mountain; but the cloud does not reach far, because the cooling influence of the mountain passes off and the vapour soon resumes its invisible form.

So much for fogs in general—the damp white normal fog of all parts of the world, where fogs exist at all.

We come now to London fogs, which are being execrated to an extreme extent. We should be sorry to have yearly to breathe such an atmosphere as that of the winter 1879-80, but as it appears to us that the injurious effects have been exaggerated, we shall endeavour to bring the matter forward for calm consideration.

Dr. Alfred Carpenter is desperately hard upon the fogs; he calls them "a mighty evil, every year increasing in intensity and slaying its tens of thousands before their time." He says: "Cold kills, but cold with London smoke kills with double weight and leads to innumerable sudden deaths, as the Registrar-General's tables convincingly tell us."

As regards the "mighty evil," we need only give another paragraph from the letter from which we have just quoted:—

"But the carbon was not the only evil present, for the smells which came up from the sewers were most marked, and had the cloud been accompanied by a falling instead of a rising barometer the stenches from the London sewers would have been still more formidable. But, Sir, there is a wonderful adaptation of circumstances to cases which excites my intense admiration. London is not completely handed over to the mercies of decomposing sewage. The smoke which enveloped London on this Sunday was not only a destructive agent but a protector. Soot is doubtless a deodorizer, and, possibly, a disinfectant. The albumenoid matter which escaped from the West-end sewers, and is sometimes the carrier of infective material, was fortunately deprived of its more serious miasm by the sooty atmosphere in our streets."

Then Dr. Carpenter (and also the writer of the leader in *The Times*) says that the fogs are every year increasing in intensity. We admit that it would not be easy to find a worse winter than that of 1879-80, but our own experience, and the result of *every* enquiry which we have made upon the subject, negative the statement. We believe that

the amount of obscuration has been nearly constant throughout the century, two causes having worked in opposite directions. In the first place the enormous increase in the area of the metropolis, and the substitution of roofs, pavements, and paved or macadamized and drained streets for many, many square miles of meadow and marsh land, has undoubtedly diminished the area whence evaporation could proceed, and has therefore *pro tanto* lessened the intensity of natural fogs. On the other hand, this same development of the metropolis has increased the number of smoking chimneys, and so may have made the fogs darker than they used to be. But in this respect it must not be forgotten that there is no proof that there are more chimneys *per square mile* than there used to be; therefore it seems that it is more probable that the area of the dark fogs has been increased than that they have become more dense.

As to the tens of thousands slain by the fogs, we hardly know what to say after Dr. Alfred Carpenter has called the fog of October a protector. But when he goes on to say, "Cold with London smoke kills with double weight and leads to innumerable sudden deaths, as the Registrar-General's tables convincingly tell us," we really are aghast. We thought it was becoming a recognized fact that London was one of the healthiest cities in the world, and yet this paragraph is enough to frighten anybody. As to the innumerable sudden deaths, of which the tables of the Registrar-General tell us. We did not know that the Registrar-General owned his department to be unable to number them. We have seen some sensational paragraphs in the otherwise very dry quarterly returns of that department, but a table showing "innumerable sudden deaths" from cold and smoke would be a curiosity.

A very rich idea was started by an anonymous writer in *The Times*, who considered that landlords and the owners of property in the metropolis were interested in the question, because "The number of houses to let is noticeable, and they will probably increase, for who that is not obliged, will continue to live in so oppressive and depressing an atmosphere, least of all bring up their children in it?"

(To be continued.)

THE WEATHER IN NOVEMBER.

The first week was characterized by very fair weather in nearly all parts of the United Kingdom. Bright aurora was seen in almost all places on the evening of the 3rd.

The charts of the 3rd showed an anti-cyclone (30·3) extending from E to W. across Ireland, the N. of Great Britain, and the North Sea to Denmark; a rather deep depression over S. France, where the bar. fell 0·5 in.; and a second disturbance in N. Norway. By the following morning the centre of the former (which was then dispersing) was near Toulon, while the latter, advancing E. wards, caused a brisk decrease of pressure over the whole of Scandinavia. During the 4th the bar. rose quickly in France, slightly in Scandinavia, both disturbances having disappeared, but decreased over our islands. Next day the bar. fell generally—quickly so in the N., owing to the passage across the extreme N. of Norway of a large depression. A considerable change in the general distribution of pressure took place in the course of the night (7th–8th).

A rapid rise of the bar. began on our W. and N.W. coasts, spreading in a less degree over nearly the whole of our islands, while over the Channel and France, Denmark and S. Scandinavia, pressure decreased, small disturbances being shown in those neighbourhoods. In the N. of Norway and Sweden, as the depression travelled away, the bar. rose. During the night (8th–9th), however, a deep depression suddenly advanced to the N. coast of Scotland, occasioning a rapid decrease of pressure in Scotland, and a brisk decrease in almost all parts of our islands; in the S.W. in France, and on the E. shores of the North Sea, the mercury rose, so that an area of high pressure now extended over S. England, N. France, and the Netherlands, while over N. Spain an area of comparatively low readings was shown.

Temp. less than the average throughout our islands; over England the deficit varied 4° to 6°, elsewhere from 2° to 3°. The highest of the max. was 59° at Foynes. The min. occurred mostly at the earlier part of the week; the lowest readings (18° at Shrewesbury, 19° at Glenalmond) were recorded on the 2nd.

Rainfall considerably below the mean in all districts. Heaviest fall, 2·30 in. at Laudale; lightest fall 0·02 in. at Plymouth and Donaghadee.

Bright sunshine was more prevalent than in the preceding week, except in Ireland. Max duration, 36 hours at Aberdeen and Geldeston; min. duration, 11 hours at Glasgow.

Very dull weather prevailed in our islands during the next week, (9th-15th); heavy rain was all but general, and at some places in the N. showers of snow fell. A thunder-storm was experienced at Hastings on 15th.

The deep depression above noticed as being over N. Scotland on the morning of the 9th, subsequently moved S.E. wards, until on the morning of the 10th it was over Denmark. The bar. consequently fell quickly on the E. shores of the North Sea, and there was a brisk decrease in N.E. France and E. England. At the same time a separate decrease began during the night in the extreme S.W. of Ireland, while in Scotland, N. and Central England, pressure recovered. The report of the following day showed that pressure was then increasing on the E. shores of the North Sea and in N.E. France; but was decreasing in W. France, the whole of our islands, and Sweden. A large area of comparatively high pressure lay over France; considerable depressions were shown to the N. of Scotland and in N. Scandinavia, while some very small and shallow depressions passed slowly from W. to E., across the S. of these islands. Hence E. winds prevailed over the Bay of Biscay, and breezes between W. and S. in most other parts of W. Europe. Quite unimportant were the changes in the general distribution of pressure on the next day, but during the night (12th–13th) a deep depression advanced from the Atlantic to N. Scotland, and produced a fall of the bar. throughout W. Europe: the change varied from 0·74 in. at Haparanda, and 0·59 at Leith, to 0·01 at Rochefort, and 0·02 at Toulon. The charts of the 14th, and 3 following days, exhibited a remarkable state of things. The bar. had continued falling during the 13th, owing to the passage from S.W. to N.E. of two large depressions—the former being that noticed as near the N. coast of Scotland on the morning of the 13th, the latter a fresh disturbance from the Atlantic; the centres of both of these being below 29 inches. During the night (14th–15th), the bar. rose over the greater portion of W. Europe, but early on the 15th a new and brisk decrease began in the S.W. of Ireland, caused by the advance from the Atlantic of a fresh disturbance. Hence the chart of the 15th showed an area of high pressure in S. France, comparatively uniform readings in these islands, a disturbance off Ireland, and a deep depression over N. Norway. In the course of the following night (15th–16th) the depression in the W. of Ireland advanced to the neighbourhood of Holyhead, and proved to be deeper than either of its immediate predecessors, the reading at the centre being 28·45. In N.W. England the decrease exceeded an inch, and was more than 0·5 in. throughout our islands. In Scandinavia the bar. rose rapidly.

Temp. above the mean. in all parts of our islands. The max. occurred generally on the 13th, when a value of between 60° and 63° was registered over central and N.E. England. The lowest of the minima (varying from 19° at Glenal-

mond to 22° at Cirencester, and 25° at Brookeborough) were recorded on the 9th in England, and on the 15th over Scotland and Ireland.

Rainfall more than the average in all districts. Heaviest falls, 4·54 in. at Stonyhurst, 3·23 at Mullaghmore; lightest fall, 0·57 at Nairn.

Bright sunshine was of very short duration everywhere, Max. duration, 15 hours at Glenalmond; min. duration, 1 hour at Hillington.

The next week (16th–22nd) was distinguished by rather cloudy, very cold, and unsettled weather in all parts of our islands; much snow fell in the more N. districts, and sharp thunderstorms occurred at Dublin on 18th and 19th.

The depression travelled away rapidly during the 16th, and at 8 a.m. on the 17th, as shown on the chart, was over S. Scandinavia. The bar. fell 0·75 in. at Fanö, and 0·67 in. at Skudesnaes, but over the whole of our Islands and N. France pressure increased. The change in W. England exceeding 0·5 in. Several peculiar changes took place in the course of the following 24 hours. The appearance of a well-marked depression at the mouth of the Channel caused a rapid fall of the bar in the S.W.; but over Scandinavia, Denmark, Scotland, E. England and E. France the mercury rose. The wind was S. in France, E. in S. and W. England and Ireland, N. in Scotland and E. England, and blew a gale over the Bay of Biscay. This depression passed slowly E.N.E.ward during the 18th until, on the morning of the 19th, it was over N. Germany, and thence it passed on N.E.wards during that day, and disappeared. In its rear, pressure increased (the change amounting to 1·08 in. at Cuxhaven, and an inch at Yarmouth), and became high over England, the North Sea, and N. Germany on the 20th; but gave way rapidly on our W. coasts, owing to the advance from the Atlantic of a depression: this, however, did not advance much E.wards during the day (21st) and following night, but grew deeper apparently. Next day a slight rise of the bar. was reported from N. Germany, and a slight recovery from S. Ireland, but the mercury fell elsewhere, the change being considerable in the N. The depression in the W. did not advance, but appeared to shift obliquely along the W. coasts.

Temp. much less than the average throughout our Islands, the deficit ranging from 13°·4 at Glasgow, and 14°·2 at Silloth, to 2°·7 at Spurn Head. At the earlier part of the week the ther. was comparatively high, and a value of 57° was recorded at Cambridge; but a fall soon took place, and at the latter part of the week temp. was extremely low. The lowest of the minima, 12° at Glenalmond and 13° at Leicester, were registered on the 22nd.

Rainfall above the mean in N E. and S. England and S. Ireland; but below elsewhere. Heaviest fall: 2·55 in. at St. Leonard's; lightest fall: 0·04 at Hereford.

Bright sunshine shewed an increase everywhere. Max. duration: 31 hours at Pembroke; min. duration: 5 hours at Glasgow.

Mild weather was general in our Islands during the last week of the month. Rather heavy rain fell in the S. and W.; lightning was seen in several places, and thunder heard in London on the 25th and at Stornoway on the 26th.

The large depression on the W. coast had reached the Scotch N.W. coast by the morning of the 24th, and the N. coast by the next morning, when it had become much deeper (28·8): the chart of the 26th showed that this was then over N. Norway, while a new and deeper depression (28·5) succeeded to its former position, and caused a decrease of pressure in N. Ireland amounting to upwards of 0·5 inch: this disturbance, too, travelled away, taking the same course as the former, being over N. Norway on the morning of the 27th. In its rear pressure recovered fast, the rise varying from an inch in N. Ireland to 0·3 in. in S.E. England. Readings were now highest in S. France, lowest in Scandinavia. On the 28th a slight fall of the bar. took place within the area of high pressure over France, whilst a brisk rise occurred over our islands, especially in the N.: so that whilst readings remained highest (30·6) in the vicinity of Paris, lowest to the N. of Scotland, gradients became much less steep. Next day an increase of pressure began in E. France, the larger portion of Great Britain, and in Norway; but in W. France and in Ireland, the bar. fell. An anticyclone was formed over France, and a large depression was over

N. Scandinavia. During the 24 hours following, the bar. rose briskly in N. Scandinavia, owing to the disappearance of the depression; but fell quickly in all parts of W. Europe. The anticyclone kept the former position, whilst a large shallow depression (29·6) was shewn over the N. of Scotland, and two small subsidiaries over Ireland. Hence pressure was now highest over France, and lowest over N. Scotland and the Gulf of Bothnia.

Temp. was slightly above the average throughout our Islands. The max. were high for the time of year; ranging from 54° to 59°. The only occasion on which a low reading was recorded was the morning of the 23rd, when the ther. receded to 12° at Glenalmond, 17° at Leicester, 18° at Durham, Cirencester, and Silloth.

Rainfall rather less than the mean in central and E. England and E. Scotland; more elsewhere. Heaviest falls: 4·64 in. at Loch Sunart, 2·32 in. at Roche's Point; lightest fall: 0·10 in. at Spurn Head.

Bright sunshine was more scarce than during the week preceding. Max. duration: 22 hours at Dublin; min. duration: 3 hours at Glenalmond.

Lowestoft. H. E. M.

N.B.—In *Met. Mag.*, vol. xv., p. 155, line 27 from bottom of page, for "British Channel" read "*Bristol* Channel. This occurred in printing.

THE WINTER OF 1880–81.

To the Editor of the Meteorological Magazine.

SIR,—In your last number I promised to give reasons for expecting a "somewhat colder winter than (39°·2) the average" of the last 40 years. The following are my reasons:—

1. When snow has been observed near London as early as October, a colder winter than the average has followed ten times in eleven. The following table shows this:—

Year.	First Snow.	Where Observed.	Mean temp. of following Dec. to Feb., below 39°·2 at Greenwich.
1810	October 29th ...	Stratford and Clapton	—2°·0
1819	do. 21st ...	Tottenham and Stratford	—4°·0
1820	do. 22nd ...	do. do.	—1°·4
1825	do. 20th ...	do. do.	—0°·9
1829	do. 7th ...	do. do.	—5°·9
1836	do. 29th ...	Chiswick	—0°·2
1838	do. 12th ...	do.	—1°·0
1848	do. 18th ...	Greenwich	+3°·2
1859	do. 22nd ...	Camden Town	—1°·8
1869	do. 27th ...	do.	—1°·8
1878	do. 30th ...	do.	—4°·6
1880	do. 19th ...	do.	...

Only one exception in 70 years will, I think, justify some confidence in the rule.

2. The mean rainfall of August in Scotland (according to the returns of all the stations in the said 50 station table given in your monthly *Met. Mag.*) is usually greater than the August mean of all the English returns that you give in the 50 station table. When,

however, this normal condition of things is reversed, and England appears wetter in August than Scotland, the succeeding winter has been colder than the average, at least, since 1865. The years 1869, 1870, 1878, 1879, and 1880 furnish the only instances of a reversal of the normal condition of things referred to, and, in each case, up to the present time the following winter has been cold.

3. Severe winters usually recur after about 41 years. The winters of 1788-9, 1794-5, 1796-7, 1799-1800, 1813-14, 1819-20, 1829-30, and 1837-8 were excessively severe, and they had their counterparts (in each case after an interval of 41 years) in the severe winters of 1829-30, 1835-6, 1837-8, 1840-41, 1854-5, 1860-61, 1870-71, and 1878-9. Forty-one years ago the mean temperature of the winter was 39°·6, which is 0°·1 colder than the present adopted Greenwich average of 20 years, but somewhat above the long (109 year) average. Forty-one years ago, however, the four months' winter—December to March inclusive—was as much as 1°·5 colder than the Greenwich average of 20 years. So, on the whole, we may reckon on the winter of 1880-81 being somewhat colder than the average, but still not much below the mean.—Yours, &c,

GEORGE D. BRUMHAM.

Barnsbury, December 6th, 1880.

ANEMOMETRICAL RESULTS AT MODENA.

To the Editor of the Meteorological Magazine.

[TRANSLATION.]

SIR,—I have the honour of communicating to you a new result respecting the velocity of wind at Modena which I have recently obtained.

By the discussion of twelve years' hourly observations, I have determined for each month the hour of the greatest (*maximum maximorum*) and of the least (*minimum minimorum*) velocity of the wind. Assuming that these hours belong to the middle of the month, I have united by a periodic formula the hours of maximum and those of minimum, and have thus obtained the two following formulæ :—

$$\begin{aligned}\text{Max. maximorum} = {} & 8^{h}\cdot 08 + 3^{h}\cdot 777 \tan (112°5'\cdot 0 + M) \\ & + 2\cdot 677 \tan (66°12'\cdot 7 + 2M) \\ & + 1\cdot 018 \tan (54°35'\cdot 6 + 3M) \\ \text{Min. minimorum} = {} & -2\cdot 50 + 3\cdot 541 \tan (94°32'\cdot 1 + M) \\ & + 1\cdot 872 \tan (87°33'\cdot 0 + 2M) \\ & + 1\cdot 410 \tan (90°\ 0'\cdot 0 + 3M)\end{aligned}$$

In the latter formula the negative hours are those which have to be subtracted from 24, for example $-2\cdot 5 = 21\cdot 5^{h}$.

These two formulæ give calculated values sufficiently near to the observed values, especially for the min. minimorum.

	Maximum maximorum.			Minimum minimorum.		
	Calculated.	Observed.	Difference.	Calculated.	Observed.	Difference.
January.....	14h·8	13·0	+1·8	+3·5	+4·0	—0·5
February ...	10 ·5	13·0	—2·5	—1·1	—2·0	+0·9
March	5 ·0	3·0	+2·0	—4·4	—4·0	—0·4
April	3 ·3	4·0	—0·7	—4·3	—4·0	—0·3
May	4 ·5	5·0	—0·5	—4·3	—5·0	+0·7
June	5 ·7	5·0	+0·7	—5·4	—5·0	—0·4
July	6 ·7	7·0	—0·3	—5·2	—5·0	—0·2
August	7 ·9	8·0	—0·1	—3·7	—4·0	+0·3
September...	8 ·0	8·0	0·0	—3·7	—4·0	+0·3
October	7 ·5	7·0	+0·5	—4·0	—3·0	—1·0
November ...	9 ·5	10·0	—0·5	—0·9	—2·0	+1·1
December ...	13 ·6	14·0	—0·4	+3·6	+4·0	—0·4

The accompanying curves show instantly that their course is sensibly parallel. In order to form a true judgment respecting the argument, I have formed the *schema* of the differences, and by the method of inflexions have obtained the following values for the instants of the maxima and minima of the two curves. It is evident that the maxima M of the curves indicate that the hours approach noon, and the minima m midnight.

Here are the maxima and minima expressed in days of the civil year.

Curve of the max. maximorum.	Curve of the min. minimorum.
M 94·0	72·0
m 159·9	127·7
M 192·7	180·7
m 232·7	235·9
M 297·8	293·6
m 374·4	365·2

For the lower half the figures are sufficiently accordant; for the upper half the differences are sensible, and especially for the 22 days of the first M from March 13 to April 4, the 32 days for the first m from May 8 to June 9, and the 12 days for the second M from June 30 to July 12. However, it is probable that these differences are solely due to the limited series of observations, and to the difficulty of the comparisons.

Taking the mean of these dates we obtain—

M 83 or March 24	m 234 or August 22
m 144 or May 24	M 296 or October 23
M 187 or July 6	m 370 or January 5

Having obtained these values, one is struck by the close resemblance which they bear to those denoting the annual frequence of N.W. winds, which are—

m 75	m 191	m 295
M 135	M 239	M 369

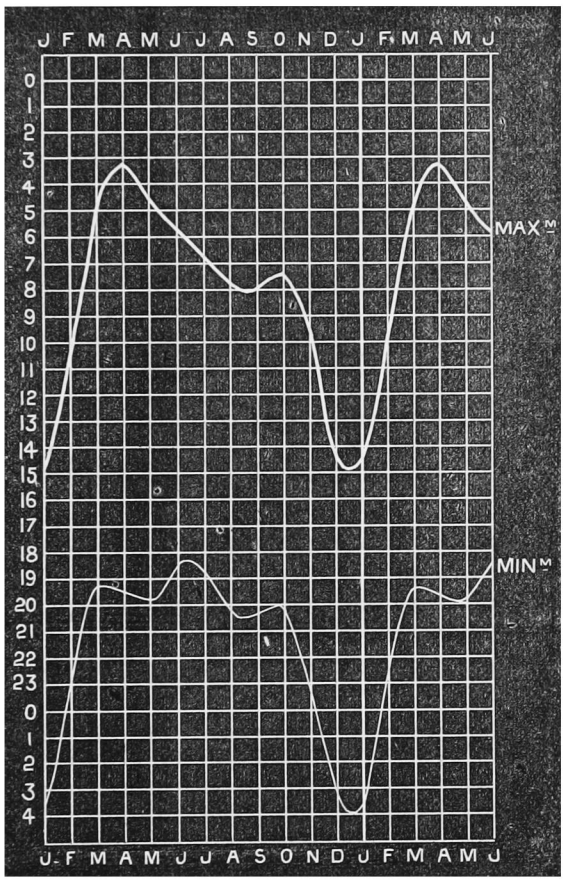
Then in all the epochs of minimum frequency of N.W. wind, the times of the extreme maximum and of the extreme minimum velocity approach towards noon, while they tend in the contrary direction at the epochs of maximum frequency of N.W. wind.

Although it is at present impossible to appreciate the whole import

of these curious accordances, because many intermediate links in the chain are still wanting, it must not be forgotten that at Modena the annual prevalence of N.W. wind is intimately related to the barometric fluctuations.

D. RAGONA.

Modena, October 18th.



REMARKABLE SUNSET.

To the Editor of the Meteorological Magazine.

DEAR SIR,—Our English sunset skies, though well meant, are usually, such tame performances that the transcendently beautiful sunset of December 9th, as seen in South Leicestershire, certainly deserves record—I would have said full description, but that task is beyond the power of my pen.

The several preceding as well as succeding days were generally marked by fine weather, by mild W. and W.N.W. winds, by red sunrises as well as sunsets, by a good deal of "Noah's Ark," and of

other forms of upper cloud, in bands from N.W. to S.E. points, by solar and lunar halos, but without parhelia, and by the unusually vivid colouring of the coronæ formed by the passage of the thin lower stratus across the moon.

The sun rose on the morning of December 9th amid much reticulated cirrus. The canopy became steadily thicker, and by one p.m. had assumed the rather uncommon form of well-developed pocky sheet cirrus ("Mammato cirro-stratus.") the under surface of the canopy of cloud hanging in numberless sacs, or rounded protuberances, which were borne along by a brisk W.N.W. current over a sluggish W.S.W. breeze; the sky becoming increasingly gloomy. Before three p.m., however, a change took place, the whole sheet descending in the atmosphere, and becoming a form of high stratus, separate (as was shown by a gap in the canopy) from the, now thin, cirrus above. This canopy appeared as a bed of stratus, containing thousands of minute inverted and imbedded cumuli, arranged with some regularity ("Mammato stratus"). The regularity of arrangement gradually became more marked, and half-an-hour before sunset the sky was very strange-looking, the whole ceiling of cloud suggesting the idea of a perfect organic structure. Exceedingly long and narrow parallel fibres extended from W.S.W to E.N.E., throwing out curved lateral branches, like the fronds of immense ferns, these lateral branches being clustered all over with rows of minute pendent swellings. No gaps could now be seen in the canopy, but in the N.W. and S.W. it terminated in broken fragments of high cumulo-stratus, the sky clearing in that direction. I stood looking at this remarkable spectacle, wondering whether the physicist were yet born who, gazing on such a cloud structure, could fully describe the causes and method of its formation, when my attention was for the time called to other matters.

When I next took an observation, the sun, itself hidden by a little low scud in the S.W, was just setting, and the illumination of the under surface of the cloud-bank was extremely magnificent. The fibres above described were of a deep salmon colour; the small protuberances of a brilliant lake; while their interspaces were of a splendid indigo blue. The little fragments of cumulo-stratus in the W. and N.W., grotesquely-shaped and innumerable, but arranged in rows, were of a deep red colour, recalling those "fierce, fiery, warriors, in ranks and squadrons, and right form of war, which drizzled blood upon the Capitol"; though, I should add, neither the phenomenon of red rain, nor any other unusual occurrence, succeeded the manifestation about which I have written.

Is there no artist possessed both of patience to study, and of power to represent, a complex cloud-structure, like that which gave us the wonderful sunset effects of December 9th?—Yours truly,

H. CLEMENT LEY,

Ashby Parva, Lutterworth, December 13th, 1880.

THE METEOROLOGICAL SOCIETY.

THE opening meeting of the Session was held on Wednesday evening, the 17th instant, at the Institution of Civil Engineers; G. J. Symons, F.R.S., President, in the chair. The following gentlemen were elected Fellows :—G. Corden, E. T. Dowson, F. Hepburn, B.A., C. M. Hepworth, J. Mulvany, M.D., R.N., T. H. G. Newton, Capt. M. Parry, E. P. Phillips, and H. L. Roth.

The papers read were :—1. "Table of Relative Humidity," by Edward E. Dymond, F.M.S. ; 2. "Rainfall in South Africa," by John G. Gamble, M.A., M. Inst. C.E., F.M.S. The author gives the monthly totals of rainfall from 103 stations for the thirteen months —December, 1878, to December, 1879,—and also the monthly means from all stations in South Africa from which a record of five years or upwards could be obtained. It is shown that the Cape Peninsula, the South West, and the West coast have winter rains with a dry summer, characteristics of what is called the subtropical region, the rains coming with the N.W. wind or anti-trade ; while Natal, Aliwal North, and in a less degree Queenstown, have the tropical features of a wet summer and dry winter.

On the South coast the rainfall appears to be more equally distributed throughout the year, though there seems to be an October maximum at Port Elizabeth and Uitenhage.

In the Central and Northern Karroo the maximum of the very scanty rainfall occurs in February and March. These rains generally fall in thunderstorms, each storm seems to come from a Westerly direction ; but it is a more or less well ascertained fact that these rains do not fall up country until the South Easters have set in on the South and South-West coasts.

In the South-East of the Colony the transition towards tropical features may be noticed, both Grahamstown and Kingwilliamstown, shewing a winter minimum in June.

3. "On the Meteorology of Mackay, Queensland," by Henry L. Roth.

4. "Thermometrical Observations on board ship," by Capt. W. F. Caborne, F.M.S.

REVIEW.

Observations made at the Magnetical and Meteorological Observatory at Batavia. Published by order of the Government of Netherlands, India. Vol. IV., large 4to, 217 pages. Government Printing Office, Batavia, 1879.

DR. BERGSMA is keeping to the high standard at which he started, and which we have already described in these pages.*

We pick out and convert into English values a few of the chief meteorological data for the Batavia Observatory in this handsome volume.

* See *Met. Mag.*, Vol. VII. (1872), p. 145, and Vol. XIV. (1879), p. 143.

Barometric Pressure at 32° and Sea Level :—

Mean pressure, 1866–78	29·896 in.
Greatest pressure, 1877, July 25th, at 10 p.m. ...	30·102 in.
Least pressure, 1870, Dec. 21st, at 3 p.m.	29 672 in.
Total range in 13 years	0·430 in.
Mean daily range	0·108 in.

(It is probably rather greater even than 0·108, as that is the difference between the means at 9 a.m. and 4 p.m., and neither the max. nor the min. occurs precisely at the hour).

Temperature :—

Mean, 1866–78	78°·7
Mean of hottest month (May)	79°·6
Mean of coldest month (January)	77°·5
Absolute maximum, 1877, Nov. 6th, 1 p.m. ...	96°·1
Absolute minimum, 1877, Sept. 9th, 6 a.m. ...	66°·0
Total range in 13 years	30°·1
Mean daily range	10°·8

Relative Humidity :—

Mean, 1866–78	83
Mean of wettest month (February)	88
Mean of driest month, (July)	78
Absolute maximum (several times)	100
Absolute minimum (1877, Sept. 25th, at 1 p.m.)	26

Rain (33 ft. above ground) :—

Mean, 1864–78	75·91 in.
Wettest year (1872)	98·59 in.
Driest year (1868)	54·21 in.
Mean wettest month (January)	15·91 in.
Mean driest month (August)	1·89 in.
Absolute wettest month (January, 1872)	33·78 in.
Absolute driest month (August to October, 1877) ...	0·00 in.
Greatest fall in one day (May 15th, 1866)	6·93 in.
Greatest fall in one hour (1867, January 10th, 2 a.m.)	3·64 in.

Dr. Bergsma does everything well, and his work is remarkably accurate. We do not remember detecting a single misprint among the millions of figures in his printed volumes. But we have two matters to bring to his notice :—

(1) The necessity of immediately establishing (if it be not already done) a second rain gauge at Batavia Observatory at or near the ground level. The roof one should continue to be observed, but a ground one is indispensable.

(2) Why print pages 38 to 73 inclusive ? They give the hourly readings of the standard thermometer, and the following 36 pages give the hourly readings of the dry bulb thermometer, and the two generally agree within a tenth of a degree. Surely the printing of the 90,000 figures on pages 38 to 73 is waste of time, of money, and of space.

Dr. Bergsma's excellent volume on the rainfall of the East Indian Archipelago we have put aside for notice in the next volume of *British Rainfall.*

SUPPLEMENTARY TABLE OF RAINFALL IN NOV., 1880.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger	3·47	XI.	Corwen, Rhug	5·43
,,	Margate, Acol	3·80	,,	Port Madoc	7·58
,,	Littlehampton	4·27	,,	Douglas.....	5·03
,,	St. Leonards	4·78	XII.	Carsphairn	7·04
,,	Hailsham	4·11	,,	Melrose, Abbey Gate...	4·81
,,	I. of W., St. Lawrence.	5·25	XIV.	Glasgow, Queen's Park.	5·52
,,	Alton, Ashdell.....	3·09	XV.	Islay, Gruinart School..	6·46
III.	Great Missenden.....	3·24	XVI.	Cupar, Kemback.....	3·68
,,	Winslow, Addington ...	2·29	,,	Aberfeldy H.R.S.	4·98
,,	Oxford, Magdalen Col...	1·99	XVII.	Tomintoul.....	3·91
,,	Northampton	2·03	,,	Keith H.R.S.	3·67
,,	Cambridge, Merton Vil.	1·90	,,	Forres H.R.S.	3·62
IV.	Harlow, Sheering	2·18	XVIII.	Strome Ferry H.R.S....	8·71
,,	Diss	2·40	,,	Auchnasheen H.R.S. ...	...
,,	Swaffham	2·11	,,	Lochbroom	8·04
,,	Hindringham	2·49	,,	Tain, Springfield.....	2·38
V.	Salisbury, Alderbury...	2·57	,,	Loch Shiel, Glenfinnan.	16·01
,,	Calne, Compton Bassett	2·92	,,	Dalwhinnie H.R.S.....	...
,,	Beaminster Vicarage ...	5·53	XIX.	Lairg H.R.S.	1·59
,,	Dartmoor, Princetown..	10·08	,,	Altnabreac H.R.S.	...
,,	Langtree Wick	...	,,	Watten H.R.S.	3·15
,,	Lynmouth, Glenthorne.	5·55	XX.	Fermoy, Glenville	5·72
,,	St. Austell, Cosgarne...	4·52	,,	Tralee, Castlemorris ...	4·39
,,	Taunton	2·54	,,	Cahir, Tubrid	3·93
VI.	Bristol, Ashleydown ...	3·09	,,	Tipperary, Henry St....	3·28
,,	Ross	2·97	,,	Newcastle West	...
,,	Wem, Sansaw Hall.....	2·81	,,	Kilrush	4·63
,,	Cheadle, The Heath Ho.	3·01	,,	Corofin	6·08
,,	Bickenhill Vicarage ..	1·92	XXI.	Kilkenny, Butler House	3·42
VII.	Melton, Coston	1·57	,,	Carlow, Browne's Hill..	3·23
,,	Horncastle, Bucknall ...	2·12	,,	Kilsallaghan.....	3·48
VIII.	Walton-on-the-Hill.....	3·88	,,	Navan, Balrath	3·61
,,	Broughton-in-Furness ..	7·20	,,	Athlone, Twyford	5·07
IX.	Wakefield, Stanley Vic.	1·86	,,	Mullingar, Belvedere ...	5·22
,,	Ripon, Mickley	3·35	XXII.	Ballinasloe	5·30
,,	Scarborough.....	2·31	,,	Clifden, Kylemore	10·98
X.	Mickleton.....	3·53	,,	Crossmolina, Enniscoe..	9·07
,,	Haltwhistle, Unthank..	4·21	,,	Carrick-on-Shannon ...	4·85
,,	Shap, Copy Hill	10·88	XXIII.	Dowra	4·76
XI.	Llanfrechfa Grange	5·85	,,	Rockcorry.....	3·99
,,	Llandovery	6·60	,,	Warrenpoint	3·60
,,	Solva.....	2·98	,,	Newtownards	2·73
,,	Castle Malgwyn	6·24	,,	Carnlough.....	5·62
,,	Rhayader, Nantgwillt..	7·98	,,	Bushmills	3·73
,,	Carno, Tybritle	6·26	,,	Buncrana	5·59

NOVEMBER, 1880.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Dpth	Greatest Fall in 24 hours. Date.	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date.	Min. Deg.	Min. Date.	No. of Nights below 32°. In shade.	No. of Nights below 32°. On grass.
			inches	inches.	in.								
I.	ENGLAND.	Camden Square	1·85	— ·56	·54	15	13	58·0	13	24·6	22	12	18
II.		Maidstone (Hunton Court)	3·19	+ ·16	·99	18	14	...	...	...	...	...	...
,,		Strathfield Turgiss	2·08	...	·41	14	15	57·1	13	21·5	22	11	19
III.		Hitchen	2·36	+ ·22	·66	15	12	55·0	13	20·0	21	13	...
,,		Banbury	2·06	— ·14	·71	15	13	57·0	13*	19·0	22	13	...
IV.		Bury St. Edmunds (Culford)	2·05	— ·34	·57	15	14	58·0	13	20·0	21	11	...
,,		Norwich (Cossey)	1·95	— ·60	·37	18	19	59·5	13	24·5	23	14	14
V.		Bridport	3·94	+ ·78	1·35	18	15	...	...	...	...	...	...
,,		Barnstaple	3·89	— ·25	·64	15	18	58·0	14†	25·0	22	...	...
,,		Bodmin	4·29	— ·69	·73	15	19	56·0	14	29·0	22	6	10
VI.		Cirencester	3·05	+ ·26	·83	15	16	...	...	...	...	...	...
,,		Shifnal (Haughton Hall)	1·87	+ ·30	·71	14	15	59·0	13	18·5	21	12	15
,,		Tenbury (Orleton)	2·17	— ·30	·60	15	17	59·5	13	17·8	21	12	14
VII.		Leicester (Town Museum)	1·67	...	·47	15	14	61·0	13	13·3	22	13	24
,,		Boston	1·94	— ·20	·48	14	14	60·0	14	25·0	23	12	...
,,		Grimsby (Killingholme)	2·86	...	·61	14	19	58·0	13	27·0	23	6	...
,,		Mansfield	2·91	...	1·28	14	16	58·5	13	20·8	21	13	17
VIII.		Manchester (Ardwick)	3·63	+ 1·00	·79	14	18	59·0	13	21·0	23	10	...
IX.		York	2·49	+ ·51	·75	17	12	61·0	13	19·0	21	12	16
,,		Skipton (Arncliffe)	9·78	+ 3·33	2·55	13	25	57·0	13	17·0	20	...	...
X.		North Shields	2·32	— ·38	·42	15	19	60·0	13	18·5	21	11	13
,,		Borrowdale (Seathwaite)	22·70	+ 6·03	4·75	13	21	...	...	...	...	..	...
XI.	WALES.	Cardiff	3·67	...	·90	15	14	57·3	14	25·8	22	9	...
,,		Haverfordwest	5·58	— ·09	1·07	15	17	56·0	14	22·5	20	8	14
,,		Aberdovey	4·95	...	1·21	15	18	...	...	...	...	...	...
,,		Llandudno	4·28	+ 1·12	·70	16	16	57·3	13	25·7	22	7	...
XII.		Cargen	5·79	+ 2·00	1·00	24	20	59·2	13	16·0	21	14	...
,,		Hawick (Silverbut Hall)	4·59	...	1·02	14	17	...	...	...	...	...	...
XIV.		Douglas Castle (Newmains)	8·76	...	1·05	13	23	...	...	...	...	...	...
XVI.		Loch Long (Arddaroch)	...	...	...	...	...	...	...	...	...	...	...
,,		Kilmory	7·47	...	·91	12	20	...	...	16·0	20	14	...
,,		Mull (Quinish)	6·78	...	1·01	30	22	..	...	...	...	...	...
,,		Loch Leven	4·30	+ ·65	·60	14	17	...	...	...	...	...	...
XVII.	SCOTLAND.	Arbroath	2·71	— ·18	·48	16	14	57·0	13	16·0	21	13	...
,,		Braemar	4·42	+ 1·60	1·03	26	19	51·9	6	16·0	20	15	24
XVIII		Aberdeen	2·58	...	·43	12	21	56·0	11	15·0	20	13	...
,,		Portree	9·71	— ·77	1·53	30	23	...	...	...	...	...	...
,,		Inverness (Culloden)	3·17	+ ·58	...	...	..	55·8	6	14·8	21	13	20
XIX.		Dunrobin	3·06	+ ·75	·80	30	20	56·0	6	21·0	15¶	14	...
,,		Sandwick	4·28	+ ·28	·62	12	25	53·1	6	27·0	15	10	15
XX.		Cork (Blackrock)	5·72	...	1·34	22	19	59·0	11‡	22·0	3	11	...
,,		Darrynane Abbey	...	...	...	...	...	...	...	...	...	...	...
,,		Waterford	4·12	+ ·17	·56	15	22	55·5	7, 13	27·0	9, 18	11	...
,,		Killaloe	6·09	+ 1·20	1·16	13	17	58·0	12	26·0	9**	10	...
XXI.	IRELAND.	Portarlington	3·34	— ·58	·66	15	22	57·5	...	26·0	3	13	...
,,		Monkstown	3·16	+ ·27	·70	15	18	..	...	...	...	...	...
XXII.		Galway	6·55	...	1·40	12	20	55·0	14§	25·0	20	8	...
XXIII		Waringstown	3·16	...	·55	15	22	59·0	13	18·0	19	11	14
,,		Londonderry	5·55	...	1·58	13	24	56·0	12	22·5	20	5	14
,,		Edenfel (Omagh)	4·85	...	1·20	13	22	56·0	13	14·0	19++	17	...

* And 14. † And 15. ‡ And 13. § And 29. ¶ And 21. ** And 15, 20. †† And 20.

+ Shows that the fall was above the average; — that it was below it.

METEOROLOGICAL NOTES ON NOVEMBER.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

STRATHFIELD TURGISS.—Weather variable; sowing has been actively progressing, much wheat and many vetches being put in well. Sheep doing well; abundance of grass.

BANBURY.—High wind on 8th, 11th, 16th, 18th, and 27th. S on 15th, 17th, and 18th. Fine pale aurora on 3rd.

CULFORD.—Unusually severe frost for the time of year, and being followed by high winds, the trees were stripped of their leaves with remarkable rapidity.

NORWICH.—Max. temp. on the 22nd, 35°. Aurora on 3rd.

BODMIN.—The oscillations of the bar. between the 11th and 28th were very remarkable. Mean temp., 46°·2.

CIRENCESTER.—A few very sharp frosts, but not of long continuance; mild and pleasant afterwards; S on the 22nd.

SHIFNAL.—Another month of great and sudden changes of temp. Very cold till the 6th, then warm till 14th; min. temp. on night of 13th, 52°; severe frosts on 2nd and 21st, ice 2 in. thick on the latter day. Strong winds from S.W. on 9th and 13th, and from N.W. on 19th; unusually low bar. on 16th. Remarkable freedom from fog. A great paucity of woodcock; no fieldfares seen yet.

ORLETON.—The temp. of the month was very variable, but the mean was only half a degree below the average. The first five days were very cold, the temp. falling to 19°·8 on the morning of the 3rd; from the 9th to the 18th it was warm, with R or S daily. At noon on the 15th a sudden fall of S commenced, which covered the ground to a depth of 2 inches before 5 p.m., but it all disappeared in the night. The river Teme overflowed on the 16th; and on the 17th the flood on the Severn was higher than that of October last. From the 17th to the 24th the cold was again severe, the min. of the 21st being 17°·8, followed by a great fog. The remainder of the month was warm and pleasant; the fluctuations of the bar. were great and sudden.

LEICESTER.—S on 15th and 21st.

KILLINGHOLME.—Opening and close of month fine, middle wet and very unsettled; very little fog. Two inches of S on 18th.

MANSFIELD.—Rainfall about the average; S on 15th, 18th, and 21st.

MANCHESTER.—The month opened with seasonable weather, cold and bracing, but it soon changed to wet, with a considerable rise in temp. Frost set in again on 19th, but gave way to R on 23rd, with a higher temp., and so the month closed.

ARNCLIFFE.—Sudden and great falls of bar. frequent, but not always followed by corresponding changes in the weather; night of the 12th very wild and rough.

NORTH SHIELDS.—S on 17th, 19th, 21st, 22nd, and 23rd. Aurora on 3rd.

SEATHWAITE.—A very stormy month. A terrible storm on the 13th, with 4·75 in. of R; 4·17 in. also fell on the 12th, and 3·37 in. on the 28th. There were two other falls exceeding 1 in.

WALES.

HAVERFORDWEST.—The very cold weather of October was prolonged into November, with high pressure and easterly wind; from the 10th to the 16th was a very stormy period, with much R. A very deep depression passed on the 16th, accompanied by R and H. A sudden change took place on the 18th; S fell, the air became very wintry, and the frost continued so intense that, in some places, skating was indulged in on the 21st. From the 23rd to the end

of the month it was much milder, very wet, and very stormy; a continuous gale, especially at night, from 24th to 29th.

ABERDOVEY.—Severe hailstorm on 23rd.

LLANDUDNO.—Although the mean temp. of the month was but slightly below the average, the weather was very variable; from the 1st to the 5th it was cold but calm, from the 14th to the 21st it was cold and stormy. The rainfall was about 25 per cent. above the average.

SCOTLAND.

CARGEN.—A very stormy month; the fluctuations of the bar. and ther. were frequent and unusually rapid. S on 16th and 17th. Mean temp. 41°·1, 0°·1 below the average.

HAWICK.—Mild up to the 10th. Terrible storm of R, S, and H on the 13th and 14th; very severe frost on the 20th, but vegetables, &c. were protected by the S, which was 6 inches deep.

NEWMAINS.—S daily from 15th to 19th; total depth, 14 inches.

KILMORY.—Very sharp frost from 18th to 20th.

ABERDEEN.—Up to the 20th the prevailing winds were W. to N.W., with low night temperatures and S showers during the day; from the 21st to the end of the month the wind was southerly to south-westerly, with higher temperatures and gales. Rainfall slightly below the average. Aurora on three nights. Strong gale on 26th, the wind reaching force 10.

PORTREE.—S and hard frost prevailed from 15th to 22nd. Gale on 24th, with heavy H showers. L at night on 24th and 25th. Gale from S. all day on 26th.

CULLODEN.—Weather stormy for November; from 15th to 25th heavy S storms, with intense frost. The temp. on ground fell to 3° on the 21st, the lowest reading recorded during 40 years' consecutive observations, with the exception of Feb. 22nd, 1855, when the temp. fell to 1°. S so heavy (11½ in.) and frost so intense so early as November is remarkable. The month closed with very boisterous weather. Slight shock of earthquake at 6 p.m. on 28th.

SANDWICK.—A cold blustery month. Temp. 1°·6 below the mean, and rainfall and wind above it. The ground was white with S on the 8th, and again on the 14th, when a S storm began which lasted for six days, followed by alternate frosts and thaws till the plains were cleared of S on the 24th. Gale of 50 miles an hour on 26th from 6 p m. to midnight. T and L at 6 a.m. on 27th. Aurora on five nights.

IRELAND.

CORK.—Winds strong at times, but no heavy gales.

WATERFORD.—Early part of month cold and misty; from 23rd to 30th very warm. Very high wind on 16th. Aurora on 3rd.

KILLALOE.—First week dry and frosty; heavy rainfall and high winds from 9th to 15th; dry and frosty again from 15th to 22nd, and the month closed with rising temp, dull heavy weather and daily R.

WARINGSTOWN.—Some very sharp frost; on the whole seasonable.

LONDONDERRY.—Weather mild up to the 17th, frosty from 17th to 22nd, very stormy from 24th to 28th; max. velocity of wind, about 56 miles per hour on morning of 26th. A slight shock of earthquake was felt on the 28th, about 5.25 p.m., passing from W. to E.

RAINFALL RECORDS.

I venture to make one suggestion and one request.

The suggestion is that all persons who contemplate making rainfall observations commence on the first of January, so as to obtain a perfect record for 1881.

The request is, that any person who knows of any records not quoted in *British Rainfall*, 1879, will inform me of the fact.

G. J. SYMONS.

62, CAMDEN SQUARE, N.W., *Dec. 14th.*